

A
Presentation on
LI-FI TECHNOLOGY

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Introduction:

What is Li-Fi?

- Light Fidelity.
- A new technology for wireless communication system; which is suitable for data transmission via LEDs by illumination. It uses the visible light, a part of the electromagnetic spectrum that is still not greatly utilized.

Present scenario:

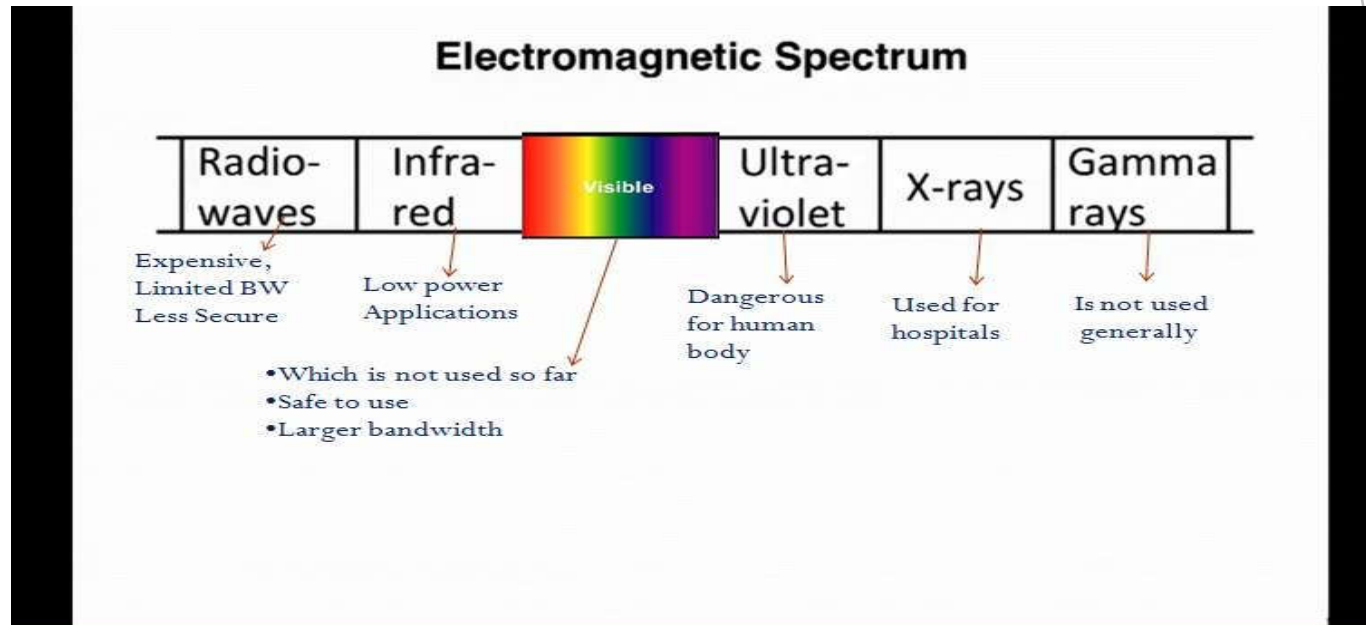


Figure no.1 Diagram of electromagnetic spectrum

VLC is providing wide bandwidth as illustrated in Figure no 1. We can obviously see that usage the optical portion of spectrum is about 10,000 times greater bandwidth compares to the usage of the RF.

Radio Spectrum Issues:

- Capacity

 - Costly

 - Less Bandwidth compared to other spectrum

- Efficiency

 - Transmitting the radio waves

- Availability

 - Limited availability

 - Unavailable in aircraft

- Security

 - Less secure(passes through the walls)

Components used in Li-Fi:

- High brightness Light-Emitting Diodes (LEDs) or any light sources, which acts as transmitter.
- A silicon photodiode has the roll of a detector and it shows a good response to visible wavelength.
- Communication channel is air.

Block diagram:

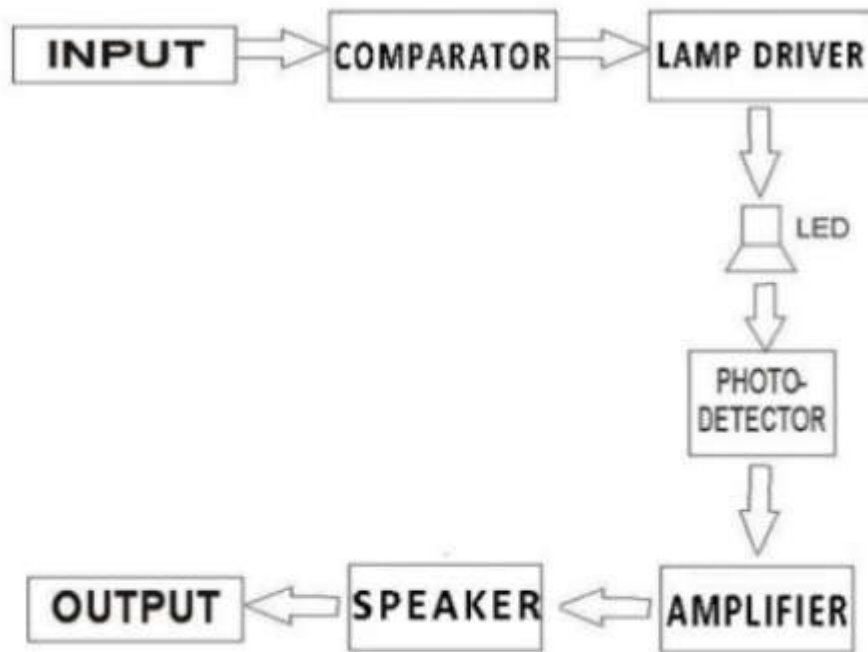


Figure no 2 Block diagram

Continued....

- Input:

Input to the system is analog signal.

- Comparator:

Used to amplify the signal using a Op-Amp.

convert the analog signal into pulse wave form.

- Lamp Driver:

Used to modulate the pulse wave with carrier signal using a transistor.

Continued.....

- LEDs:

Arrays of LEDs are used.

- Photo detector:

Detect and decode the message using photo cell.

Also demodulate the signal.

- Amplifier and Speaker:

The low voltage signal is then amplified.

- Output:

Transmit the signal to final destination.

Working principle:

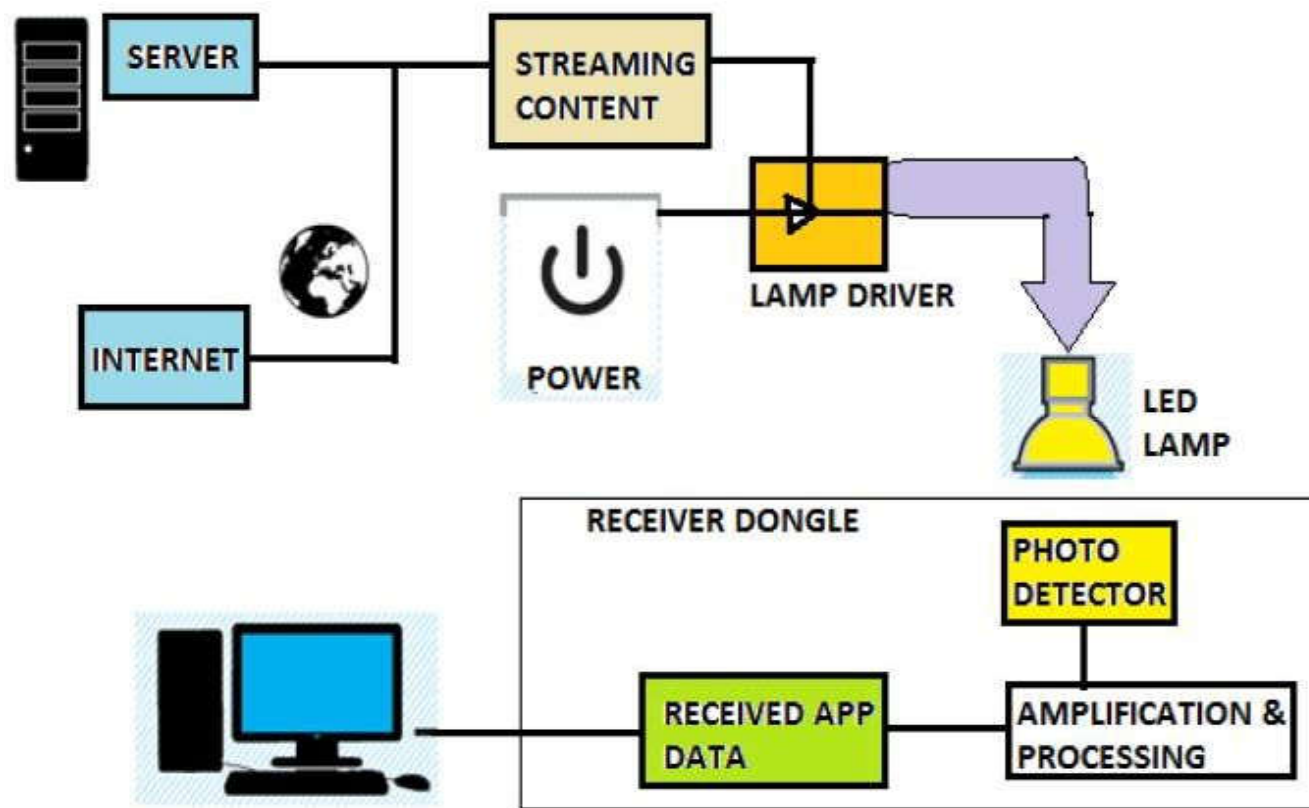


Figure no.3 Working principle of Li-Fi

Continued....

- Very simply, if the LED is on, you transmit a digital 1, if its off you transmit a 0, they can be switched on and off very quickly, which gives nice opportunities for transmitting data. It is possible to encode data in the light by varying the rate at which the LEDs flicker on and off to give different strings of 1s and 0s.
- The LED intensity is modulated so rapidly that the human eye cannot notice, so the output appears constant.
- Other ideas are using mixtures of red, green and blue LEDs to alter the light frequency encoding a different data channel.

Continued.....

- So what we need at all for sending data are some LEDs and a controller that codes data into those LEDs and for receiving data, we need an Image Sensor, Photodiode which is used as a detector.
- The LED bulb will hold a micro-chip that will do the job of processing the data. The light intensity can be manipulated to send data by tiny changes in amplitude.
- On the receiver side there is a photo detector, which convert this light into electric signals and it will give the electric signals to the device connected to it

LIFI vs WIFI :

- Li-Fi can be thought of as a light-based Wi-Fi. That is, it uses light instead of radio waves to transmit information.
- Instead of Wi-Fi modems, Li-Fi would use transceiver-fitted LED lamps that can light a room as well as transmit and receive information.
- Wi-Fi is great for general wireless coverage within buildings, and li-fi is ideal for high density wireless data coverage in confined area and for relieving radio interference issues .

Continued....

COMPARISON BETWEEN LI-FI VS. WI-FI

S. No.	Parameters	Wireless Technologies	
		Light Fidelity	Wireless Fidelity
1.	Speed for data transfer	Faster transfer speed (>1 Gbps)	Data Transfer speed (150 Mbps)
2.	Medium through which data transfers occurs	Used Light as a carrier	Used Radio spectrum
3.	Spectrum Range	Visible light spectrum has 10,000 time broad spectrum in comparison to radio frequency	Radio frequency spectrum range is less than visible light spectrum.
4.	Cost	Cheaper than Wi-Fi because free band doesn't need license and it uses light.	Expensive in comparison to Li-Fi because its uses radio spectrum.
5.	Network topology	Point to point	Point to point
6.	Operating frequency	Hundreds of Tera Hz	2.4 GHz

Applications:

- Underwater communication
- Traffic management
- Airways
- Medical applications
- Navigation system

Advantages:

- Efficiency

 - low cost

 - less energy

 - Environment

- Capacity

 - Bandwidth

- High speed

- Safety

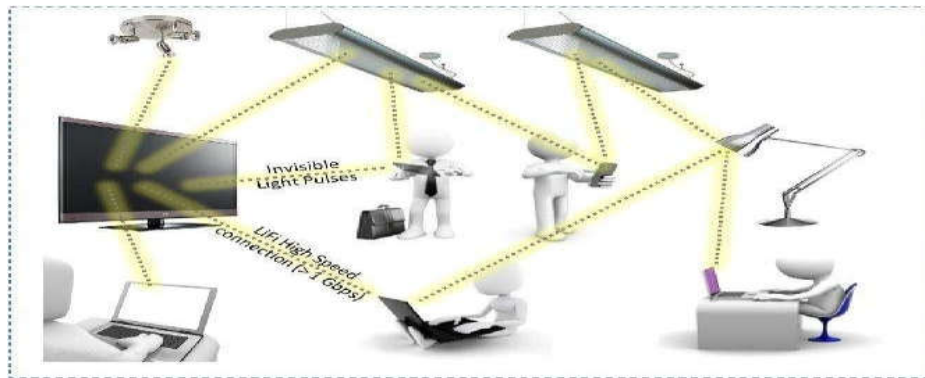
- Security

Limitations:

- Internet cannot be accessed without a light source. This could limit the locations and situations in which Li-Fi could be used.
- It requires a near or perfect line of sight to transmit data.
- Opaque obstacles can affect the data transmission.
- Interference can affect the transmission of data.
- High initial installation cost.

Conclusion:

- The possibilities are numerous and can be explored further. If this technology can be put into practical use, every bulb can be used something like a Wi-Fi hotspots to transmit wireless data.
- A genuine and very efficient alternative to radio based wireless. We can replace the traditional Wi-Fi with Li-Fi because of increasing population..



References:

[1].www.Wikipedia.com

[2].www.google.com

[3].Li-Fi study paper FN version,TEC

[4].LED for Communication Infrastructure.(2014)

The slide features abstract green geometric shapes. On the left, a small green triangle points upwards. On the right, a large, complex shape composed of several overlapping green triangles and quadrilaterals extends from the top to the bottom. A thin, light gray line starts from the bottom left of this large shape and extends diagonally towards the center of the slide.

THANK YOU